51~

KENWOOD

# SERVICE MANUAL

## Model TL-120


## LINEAR AMPLIFIER

# CONTENTS/SPECIFICATIONS



## SPECIFICATIONS

| | |
|---|---|
| **Transmit Frequency Range:** | 3.5 MHz ~ 29.7 MHz |
| **Exciter Power:** | 10W |
| **Collector Input:** | 3.5 MHz ~ 21 MHz, 160W<br>28 MHz, 140W |
| **Input, Output Impedance:** | 50Ω |
| **Power Supply:** | DC 12 ~ 16V (13.8V) |
| **Power Consumption:** | 15A (DC 13.8V) |
| **Semiconductor Complement:** | |
| Transistors: | 20 |
| Diodes: | 22 |
| **Dimentions:** | 123 (123) Wide x 97 (107) High x 235 (265) Deep<br>Values in parenthesis include protrusions. |
| **Weight:** | 2.3 kg |

**NOTE:**
Specifications are subject to change for improvements.

# FEATURE/CIRCUIT DESCRIPTIONS

## FEATURES

- All solid state medium power linear amplifier for TS-120V.
- A DC input power of 160W or more (150W or more at 28 MHz band).
- ALC circuit, power reduction circuits for protection against mis-matched load, and supply voltage drop, to prevent from distorted RF signal over-drive.
- Effective fan cooling for power transistor protection (The fan is controlled from radiator temperature).
- Protection circuits to protect power transistors
  1. Erroneous band switch setting protection circuit
  2. Radiator overheat protection circuit
  3. Output transformer overheat protection circuit
- Motorola SRF1714 as power amplifier.
- Collector current measuring terminals.
- Easy to connect with TS-120V and PS-30. With connection cable.
  (PS-30 on-off control by power switch of TS-120.)

## CIRCUIT DESCRIPTION

### ALC Circuit

The output; travelling wave level is monitored, and the output power kept to 95W at 14 MHz, 50Ω load.
For bands other than 28 MHz band, detected voltage is divided across resistors, and applied to the ALC control amplifier. The output power is therefore higher at 21 MHz or the lower band than at the 28 MHz band. The dividing ratio is selected so that about 70W is obtained at the 28 MHz band when 95W is obtained at the 14 MHz band. The divider ON/OFF transistor switch is controlled by the band selector.

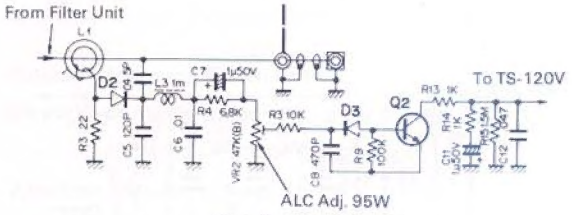



Fig. 2 ALC Circuit

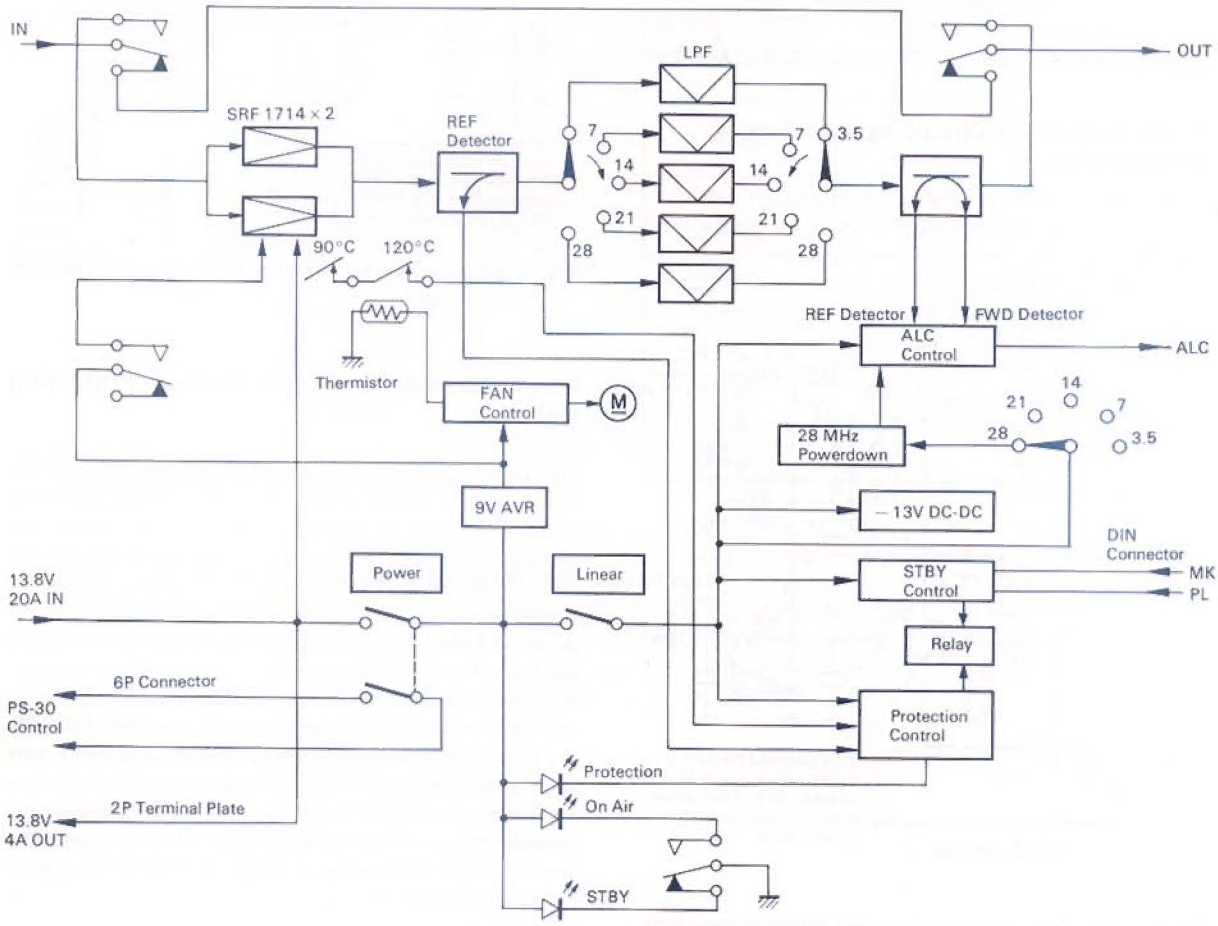



Fig. 1 Block Diagram

# CIRCUIT DESCRIPTION

## Power Reduction Circuit against Mis-matched Load

When the load impedance is other than 50Ω (VSWR > 1), the ALC circuit tries to keep the travelling wave level at the rated level so that the power transistors are not overdriven. In such a case, the power loss and amplifier deterioration increases eventually leading to breakdown. To prevent this, the reflected wave is detected and used to regulate down the amplifier driving power. The power amplifier operates then as if the supply voltage is lowered. The circuit is designed so that the travelling wave level is decreased to about 35W when a load of 150Ω is connected (VSWR = 3).

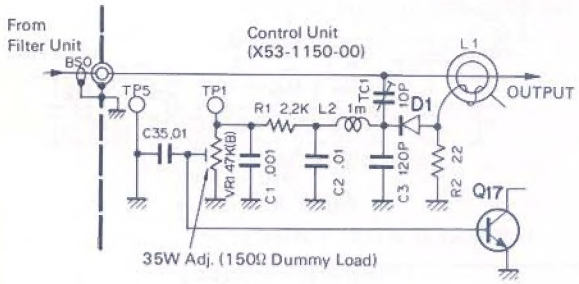



Fig. 3 Power reduction circuit against mis-matched load

## Power Reduction Circuit against Supply Voltage Drop

If the supply voltage drops, the maximum allowable amplitude of the collector voltage of the power transistors is lowered. However, the ALC circuit operates to keep the rated output power, resulting in overdrive of the power amplifier. This, increase in distortion causes unstable operation of the amplifier. To prevent this, the ALC threshold level is regulated by the supply voltage so that the limited power level by ALC is reduced when the supply voltage drops. When the supply voltage rises, the limited power level by ALC also increases, and, a circuit which is provided keeps the output power constant if the supply voltage exceeds about 14V.

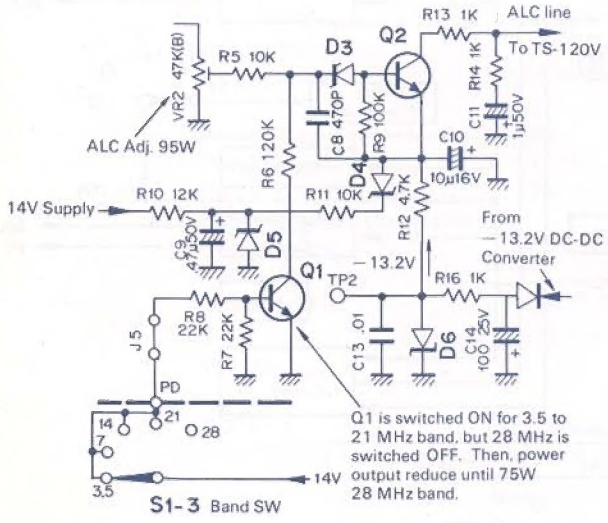



Fig. 4 Power reduction circuit against supply voltage drop and power reduction circuit for 28 MHz

## Radiator Temperature Control Fan Circuit

A thermistor is mounted on the radiator for power amplifier control of the cooling fan. (The circuit is the same as that used for TS-120S.) Even if the LINEAR switch is turned to set the linear amplifier in a standby state, the cooling fan continues to operate until the radiator temperature drops to a certain level.

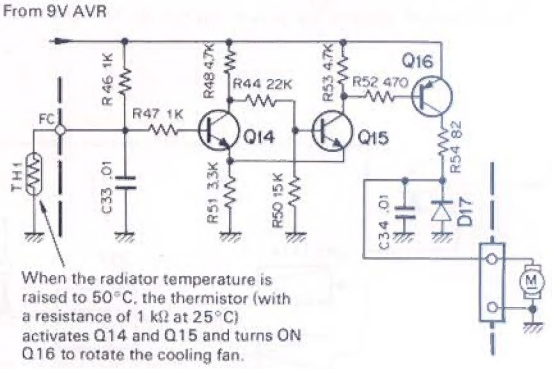



Fig. 5 Radiator temperature detecting type cooling fan control circuit

## Erraneous BAND Switch Setting Protection Circuit

The power amplifier is a push-pull broad-band amplifier which has no tuning circuit. Therefore, higher harmonic components must be suppressed by some other means. For this purpose, a LPF is provided for each band and the LPF used is selected by the BAND switch. The input impedance of LPF viewed from the power amplifier varies greatly at frequencies higher than the cut-off frequency even if the 50Ω load is connected to the output.

If the exciter frequency exceeds the LPF cut-off frequency, i.e. the band setting of TS-120V is different from that of TL-120, the power amplifier load is greatly mis-matched, and results in an abnormal operation of the power transistors. To prevent this, a reflected wave detection circuit is provided between the power amplifier and LPF. This circuit actuates the protection circuit when it detects a reflected wave from an incorrect band setting.

# CIRCUIT DESCRIPTION/SEMICONDUCTOR DATA

The protection circuit places TL-120 on standby and is directly connected to the antenna.
To relase the protection circuit, set the exciter to receive and the BAND switch of TL-120 to the same band as the exciter. Set the LINEAR switch to the STBY position. After the PROTECTION Indicator goes off, switch from LINEAR to OPERATE. This protection circuit functions only when the exciter frequency is higher than the LPF cut-off frequency (band setting of TL-120 < band setting of TS-120V). When band setting of TL-120> band setting of TS-120V, the input impedance of LPF matches with the power amplifier, and the protection circuit is inoperative. However, higher harmonic components may pass through LPF, resulting in deterioration of the transmitted signal quality. When a problem occurs in the antenna system and VSWR increases greatly, this protection circuit may cut in before the power reduction mismatched protection circuit.

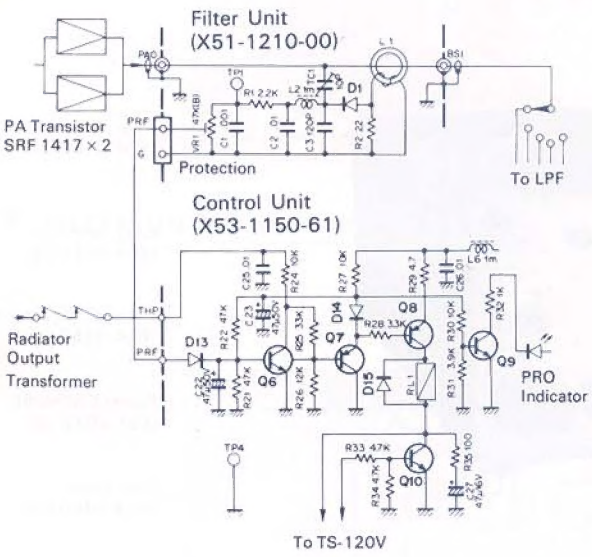



Fig. 6 Erroneous BAND switch setting protection circuit, Radiator and output transformer overheat protection circuits

## Radiator and Output Transformer Overheat Protection

In the normal operation, the cooling fan prevents the power transistor temperature from rising greatly. However, if the ventilation is not sufficient, transmission is continuous, or if the cooling fan circuit mal functions, this temperature may rise steeply. As a precaution, two overheat protection circuits are provided. One is a thermostat which detects and opens when the temperature of the radiator exceeds 90°C. The other also a thermostat connects the output transformer and opens when the temperature exceeds 170°C. When one of these thermoswitches opens, TL-120 is brought into STBY and TS-120V is connected directly to the antenna. If any of these protection circuits operate, set the LINEAR switch to the STBY position, take countermeasures to cool the instrument until the PROTECTION indicator goes off. (Protection will not be released unless the LINEAR switch is set to the STBY.

## Collector Current Measuring Terminals

A 15 mΩ shunt resistor is provided in the collector power supply circuit of the power transistors. Measuring terminals are connected to the both ends of the resistor. The collector current is found by measuring the voltage across the resistor. As a correction circuit is provided, a precise value can be obtained. The conversion rate is 10A/0.1V.

## Semiconductor Data

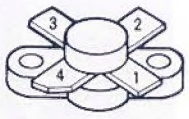
**SRF 1714 V08-1011-06 (Q1, 2 on the PA Unit)**

Application: RF band power amplifier

**Absolute Maximum Ratings** (TA = 25°C)

| Item | $V_{CEO}$ | $V_{CBO}$ | $V_{EBO}$ | $I_C$ | $P_D$ | Tstg | $R_{\theta JC}$ |
|---|---|---|---|---|---|---|---|
| Value | 25V | 45V | 4.0V | 20A | 250W | −65 ~ 200°C | 0.7° C/W |

| Color | hfe | |
|---|---|---|
| | Minimum | Maximum |
| Red | 20 | 32 |
| Orange | 28 | 42 |
| Yellow | 38 | 52 |
| Green | 48 | 63 |
| Blue | 57 | 78 |
| Violet | 72 | 93 |
| Black | 87 | 108 |
| Brown | 100 | 120 |




1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

# OUTSIDE VIEWS/INSIDE VIEWS

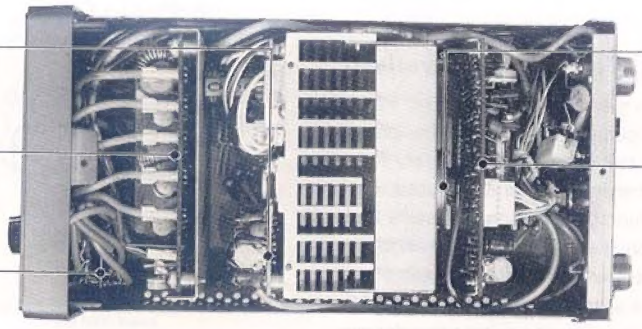
## FRONT PANEL


LED TLY-205 (V11-3163-16)
LED TLG-205 (V11-3162-86)
LED TLR-205 (V11-3162-96)
See-saw Switch (S36-2404-05)
Panel (A20-2367-03)
Case (A) (A01-0732-03)
Case (B) (A01-0758-02)
Knob (K21-0723-04)
Foot × 4 (J02-0323-05)

## REAR PANEL


7P DIN Socket (E06-0751-05)
M type Receptacle (E04-0152-05)
Wing Nut (N14-0509-05)
2P Terminal Plate (E20-0282-05)
Chip Jack (black) (E06-0102-05)
Chip Jack (red) (E06-0151-05)
M type Receptacle (E04-0152-05)
Power Connector (E31-2022-05)
Rear Panel (A23-1440-04)

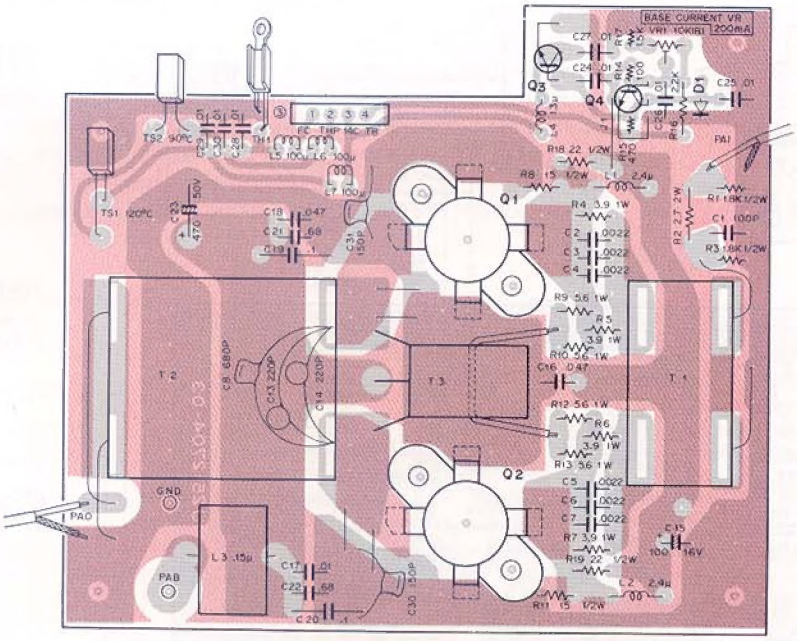
## TOP VIEWS



PA Unit (X45-1130-00)
FILTER Unit (X51-1210-00)
Rotary Switch (S01-2420-05)
FAN Motor (T40-0301-05)
CONTROL Unit (X53-1150-61)

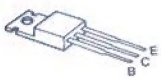
# PC BOARD

## ▼ PA UNIT (X45-1130-00)




2SC733 (Y)

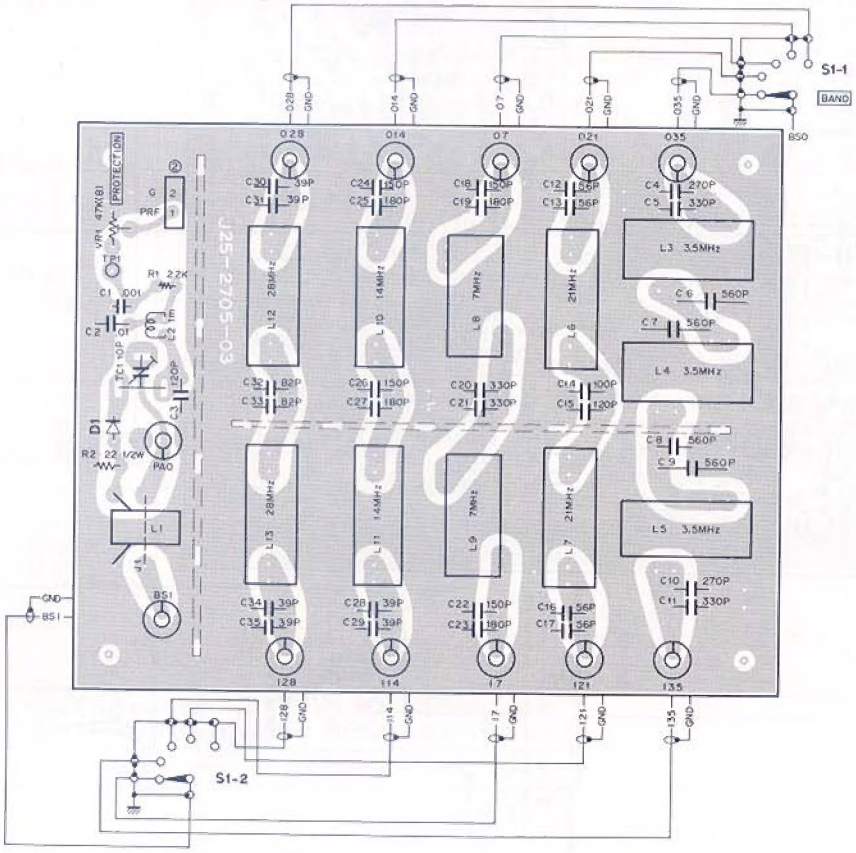

2SD235 (Y)




SRF1714


Q1,2 : SRF1714
Q3 : 2SD235(Y)
Q4 : 2SC733(Y)
D1 : SV-03

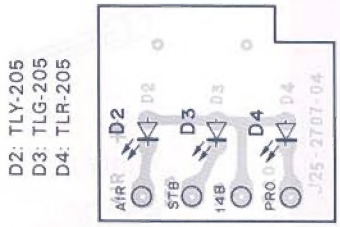
## ▼ FILTER UNIT (X51-1210-00)




D1: 1N60

# PC BOARD

## ▼ LED PC BOARD (J25-2707-04)




## ▼ CONTROL UNIT (X53-1150-61)




2SA1015(Y)
2SC1815(Y)
2SC1959(Y)



2SA562(Y)



2SA496(Y)



Q1～3,5～7,9,12～15,17 : 2SC1815(Y)
Q4 : 2SA1015(Y)
Q8,16 : 2SA562(Y)
Q10 : 2SC1959(Y)
Q11 : 2SA496(Y)
D1 : 1N60
D2,7～11,13～15,17 : 1S1555
D3 : XZ-142
D4 : XZ-162
D5 : WZ-090
D6 : XZ-132
D16 : WZ-061

# PARTS LIST

**Note 1:**
K: U.S.A. W: Europe T: Britain

**Note 2:**
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the PC board illustration. Resistors not otherwise detailed are carbon type (1/4 or 1/8W).
Order carbon resistors and capacitors according to the following example:
A carbon resistor's part number is RD14BY 2E222J.
A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J.

## RESISTOR

1. Type of the carbon resistor

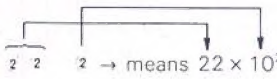

RD14BY


RD14CY

2. Wattage

1/4W → 2E
1/8W → 2B

3. Resistance value




Significant figure Multiplier

Example: 221 → 220Ω
222 → 2.2 kΩ
223 → 22 kΩ
224 → 220 kΩ
225 → 2.2 MΩ

4. **Tolerance**
J = ±5% (Gold)
K = ±10% (Silver)

## CAPACITORS

**Type I**

| CK | 45 | F | 1H | 103 | Z |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |

**Type II**

| CC | 45 | TH | 1H | 220 | J |
|---|---|---|---|---|---|
| 1' | 2 | 3' | 4 | 5 | 6 |

1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ... round, square, etc.
3 = Temp. range
3' = Temp. coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

**6 = Tolerance**

| Cord | C | D | G | J | K | M | X | Z | P | No cord |
|---|---|---|---|---|---|---|---|---|---|---|
| (%) | ±0.25 | ±0.5 | ±2 | ±5 | ±10 | ±20 | +40<br>−20 | +80<br>−20 | +100<br>−0 | More than 10μF −10~+50<br>Less than 4.7μF −10~+75 |

**Less than 10 pF**

| Cord | B | C | D | F | G |
|---|---|---|---|---|---|
| (pF) | ±0.1 | ±0.25 | ±0.5 | ±1 | ±2 |

**3 = CK45F**

Ceramic capacitor (Type I) 3

| Cord | B | D | E | F |
|---|---|---|---|---|
| Operating temperature °C | −30<br>+85 | −30<br>+85 | −30<br>+85 | −10<br>+70 |

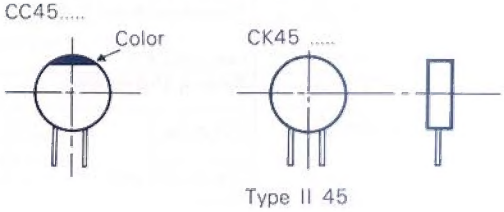
**3' = CC4500 .....**

Ceramic capacitor (Type II) temperature coeff. capacitor 1' 3'.

| 1st word (Color) | CH (Black) | LH (Red) | PH (Orange) | RH (Yellow) | SL (Green) | TH (Blue) | UH (Violet) |
|---|---|---|---|---|---|---|---|
| ppm/°C | 0 | −80 | −150 | −220 | −330 | −470 | −750 |

**5 = Capacitor value**

Example: 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001 μF
103 → 0.01 μF




Type II 45

# PARTS LIST

## GENERAL ☆ New parts

| Ref. No. | Parts No. | Description | Re-marks |
|---|---|---|---|
| C1 | CK45F1H473Z | Ceramic 0.047μF +80%, −20% | |
| R1 | R92-0620-05 | Cement resistor 5mΩ | |
| D1 | V11-2163-86 | Diode S31C | |
| D2 | V11-3163-16 | LED TLY-205 | |
| D3 | V11-3162-86 | LED TLG-205 | |
| D4 | V11-3162-96 | LED TLR-205 | |
| S1 | S01-2420-05 | Rortary switch BAND | ☆ |
| S2,3 | S36-2404-05 | See-Saw switch POWER, MODE | ☆ |
| | A01-0732-03 | Case (A) | |
| | A01-0758-02 | Case (B) | ☆ |
| | A20-2367-03 | Panel | ☆ |
| | A23-1440-04 | Rear panel | ☆ |
| | B39-0407-04 | Spacer × 2 for assistance leg | |
| | B50-2681-00 | Operating manual | ☆ |
| | E04-0152-05 | M type receptacle × 2 OUTPUT, INPUT | |
| | E06-0151-05 | Chip JACK (Red) Ic terminal | ☆ |
| | E06-0102-05 | Chip JACK (Black) Ic terminal | ☆ |
| | E06-0751-05 | 7P DIN Socket REMOTE | |
| | E20-0282-05 | 2P terminal plate DC13.8V 4A OUT | |
| | E30-1637-05 | Cable | |
| | E30-1638-05 | DC cord | |
| | E30-1640-05 | REMOTE Cable | |
| | E31-2018-05 | Coaxial Cable A BAND | ☆ |
| | E31-2022-05 | Square Connector | |
| | F05-2034-05 | Fuse (20A) × 2 | |
| | F09-0405-04 | Fan | |
| | H01-2647-04 | Carton | ☆ |
| | H10-2513-02 | Front packing fixture (F) | |
| | H10-2514-03 | Rear packing fixture (R) | |
| | H12-0465-04 | Cushion | ☆ |
| | H20-1407-03 | Protective cover | |
| | H25-0029-04 | Protective bag 60 × 110 mm | |
| | H25-0112-04 | Protective bag 180 × 250 mm | |
| | J02-0323-05 | Foot × 4 | |
| | J02-0409-04 | Accistance foot | |
| | J13-0404-05 | Fuseholder | |
| | J19-1317-04 | Diodeholder | |
| | J61-0201-05 | Vinyle tie | |
| | K21-0723-04 | Pointer knob BAND SW | |
| | N09-0256-05 | Earth screw × 3 | |
| | N14-0509-05 | Wing nut GND terminal | |
| | T40-0301-05 | FAN motor | |
| | X42-1120-10 | Coaxial cable ass'y | |
| | X45-1130-00 | PA unit | ☆ |
| | X51-1210-00 | FILTER unit | ☆ |
| | X53-1150-00 | CONTROL unit | ☆ |

## PA UNIT (X45-1130-00)

| Ref. No. | Parts No. | Description | Re-marks |
|---|---|---|---|
| **CAPACITOR** | | | |
| C1 | CC45SL2H101J | Ceramic 100pF ±5% | |
| C2 ~ 7 | CK45D2H222M | Ceramic 0.0022μF ±20% | |
| C8 | CM93D2H681J | Mica 680pF ±5% | |
| C13,14 | CC45SL2H221J | Ceramic 220pF ±5% | |
| C15 | CE04W1C101Q | Electrolytic 100μF 16W | |
| C16 | C91-0465-05 | Ceramic 0.047μF 25V | |
| C17 | CK451H103Z | Ceramic 0.01μF +80, −20% | |
| C18 | C91-0456-05 | Ceramic 0.047μF 25V | |
| C19,20 | CK45F1H104Z | Ceramic 0.1μF +80, −20% | |
| C21,22 | C91-0448-05 | Layer built 0.68μF | |
| C23 | CE04W1H471Q | Electrolytic 470μF 50WV | |
| C24 ~ 30 | CK45F1H103Z | Ceramic 0.01μF +80, −20% | |
| C10,12 | NOT USED. | | |
| C30,31 | CM93D2H151J | Mica 150pF ±5% | |
| **RESISTOR/POTENTIO METER** | | | |
| R2 | RS14AB3D2R7J | Metal 2.7Ω ±5% 2W | |
| R4 ~ 7 | RS14AB3A3R9J | Metal 3.9Ω ±5% 1W | |
| R9,10 | RS14AB3A5R6J | Metal 5.6Ω ±5% 1W | |
| R12,13 | RS14AB3A5R6J | Metal 5.6Ω ±5% 1W | |
| R1,3 8,11 | RC05GF2HOOOJ | Solid OOOΩ ±5% 1/2W | |
| R14 ~ 17 | RD14CB2EOOOJ | Carbon OOOΩ ±5% 1/4W | |
| VR1 | R12-3419-05 | Semi-fixed resistor 10kΩ (B) | ☆ |
| **SEMICONDUCTOR** | | | |
| Q1,2 | V08-1011-06 | Transistor SRF1714 | |
| Q3 | V04-0046-05 | Transistor 2SD235(Y) | |
| Q4 | V03-0183-05 | Transistor 2SC733(Y) | |
| D1 | V22-0031-05 | Diode SV-03 | |
| **COIL/TRANSFORMER** | | | |
| L1,2 | L33-0624-05 | Choke coil 2.4μH | |
| L3 | L33-0622-15 | Choke coil B 15μH | |
| L4 | L33-0025-05 | Choke coil 1.3μH | |
| L5 ~ 7 | L40-1011-03 | Ferri-inductor 100μH | |
| T1 | L13-0305-05 | Input matching transformer | |
| T2 | L19-0312-05 | Output transformer | |
| T3 | L19-0313-15 | NF Transformer | |
| **MISCELLANEOUS** | | | |
| TH1 | V11-2260-16 | Thermistor STP31L | |
| TS1 | S59-1403-05 | Thermostat (insulating type 120°C) | |
| TS2 | S59-1404-05 | Thermostat (insulating type 90°C) | |
| | E31-0451-05 | Cable A DC (RED) | |
| | E31-0452-05 | Cable B DC (BLACK) | |
| | F20-0078-05 | Insulating mica | |
| | F29-0014-05 | Insulating washer | |
| | J31-0510-04 | Spacer × 4 | |

# PARTS LIST

## FILTER UNIT (X51-1210000)

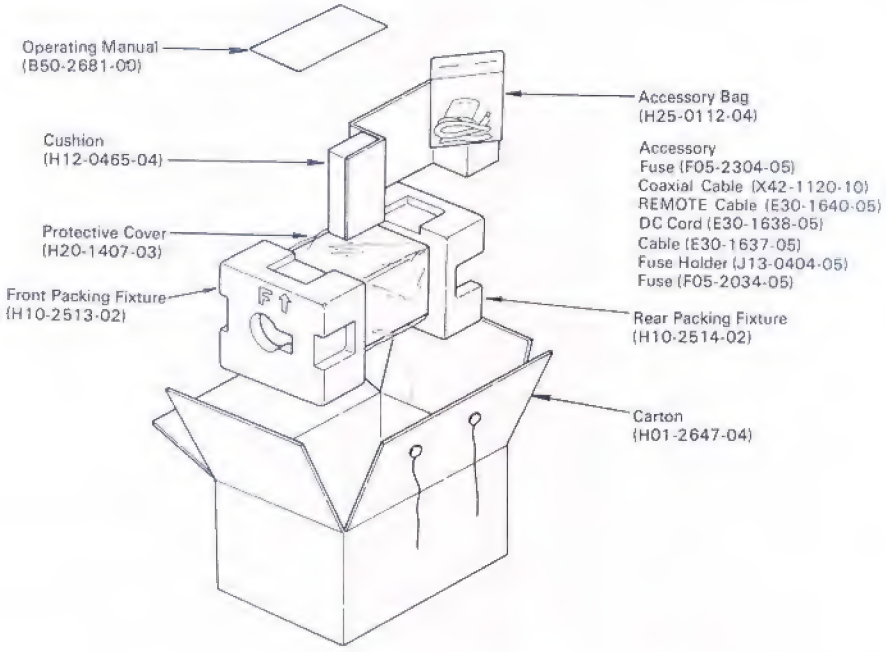
| Ref. No | Parts No | Description | Re-marks |
|---|---|---|---|
| | | **CAPACITOR** | |
| C3 | CC45CH1H121J | Ceramic 120pF ±5% | |
| C4 | CC45SL2H271J | Ceramic 270pF ±5% | |
| C5 | CC45SL2H331J | Ceramic 330pF ±5% | |
| C6 | CC45SL2H561J | Ceramic 560pF ±5% | |
| C7 | CC45SL2H561J | Ceramic 560pF ±5% | |
| C8 | CC45SL2H561J | Ceramic 560pF ±5% | |
| C9 | CC45SL2H561J | Ceramic 560pF ±5% | |
| C10 | CC45SL2H271J | Ceramic 270pF ±5% | |
| C11 | CC45SL2H331J | Ceramic 330pF ±5% | |
| C12.13 | CC45SL2H560J | Ceramic 56pF ±5% | |
| C14 | CC45SL2H101J | Ceramic 100pF ±5% | |
| C15 | CC45SL2H121J | Ceramic 120pF ±5% | |
| C16.17 | CC45SL2H560J | Ceramic 56pF ±5% | |
| C18 | CC45SL2H151J | Ceramic 150pF ±5% | |
| C19 | CC45SL2H181J | Ceramic 180pF ±5% | |
| C21.21 | CC45SL2H331J | Ceramic 330pF ±5% | |
| C22 | CC45SL2H151J | Ceramic 150pF ±5% | |
| C23 | CC45SL2H181J | Ceramic 180pF ±5% | |
| C24 | CC45SL2H151J | Ceramic 150pF ±5% | |
| C25 | CC45SL2H181J | Ceramic 180pF ±5% | |
| C26 | CC45SL2H151J | Ceramic 150pF ±5% | |
| C27 | CC45SL2H181J | Ceramic 180pF ±5% | |
| C28 ~ 31 | CC45SL2H390J | Ceramic 39pF ±5% | |
| C32.33 | CC45SL2H820J | Ceramic 82pF ±5% | |
| C34.35 | CC45SL2H390J | Ceramic 39pF ±5% | |
| | | **TRIMMER/POTENTIOMETER** | |
| TC1 | C05-0042-05 | Ceramic trimmer 10pF | |
| VR1 | R12-3054-05 | 47kΩ(B) PROTECTION Adj | |
| | | **SEMICONDUCTOR/COIL** | |
| D1 | V11-0051-05 | Diode 1N60 | |
| L1 | L39-0406-05 | Detector coil | |
| L2 | L40-1021-03 | Ferri-inductor 1mH | |
| L3 ~ 5 | L34-0896-05 | Filter coil (A) 3.5 MHz | |
| L6.7 | L34-0829-05 | Filter coil (D) 21 MHz | |
| L8.9 | L34-0827-05 | Filter coil (B) 7 MHz | |
| L10.11 | L34-0828-05 | Filter coil (C) 14 MHz | |
| L12.13 | L34-0830-05 | Filter coil (E) 28 MHz | |
| | | **MISCELLANEOUS** | |
| | E04-0154-05 | Coaxial connector × 12 | ☆ |
| | E23-0047-05 | Terminal | |
| | J31-0502-04 | PC Board color | |
| | J42-0404-05 | PC Board bush | |

## CONTROL UNIT (X53-1150-61)

| Ref. No. | Parts No. | Description | Re-marks |
|---|---|---|---|
| | | **CAPACITOR** | |
| C3 | CC45CH1H121J | Ceramic 120pF ±5% | |
| C4 | CC45CH2H050C | Ceramic 5pF ±0.25pF | |
| C5 | CC45CH1H121J | Ceramic 120pF ±5% | |
| C7 | CE04W1H010 | Electrolytic 1μF 50WV | |
| C9 | CE04W1HR47 | Electrolytic 0.47μF 50WV | |
| C11 | CE04W1H010 | Electrolytic 1μF 50WV | |
| C12 | C91-0456-05 | Ceramic 0.047μF 25V | |
| C14 | CE04W1E101Q | Electrolytic 100μF 25WV | |
| C15 | CE04W1E220Q | Electrolytic 22μF 25WV | |
| C16.17 | CE04W1C220Q | Electrolytic 22μF 16WV | |
| C21 | CE04W1C221Q | Electrolytic 220μF 16WV | |
| C22.23 | CE04W1HR47 | Electrolytic 0.47μF 50WV | |
| C27 | CE04W1C470Q | Electrolytic 47μF 16WV | |
| C28.32 | CE04W1C221Q | Electrolytic 220μF 16WV | |
| C37 | C91-0456-05 | Ceramic 0.047μF 25V | |
| C24 | NOT USED | | |
| | | **TRIMMER/POTENTIOMETER** | |
| TC1 | C05-0042-05 | Ceramic trimmer 10pF | |
| VR1.2 | R12-3054-05 | 47 kΩ (B) 35W Adj ALC Adj | |
| VR3 | R12-1406-05 | 1 kΩ (B) 9VAVR Adj | |
| VR4 | R12-0408-05 | 100Ω (B) Ic Adj | |
| | | **SEMICONDUCTOR** | |
| Q1 ~ 3 | V03-1815-06 | Transistor 2SC1815(Y) | |
| Q4 | V01-1015-06 | Transistor 2SA1015(Y) | |
| Q5 ~ 7 | V03-1815-06 | Transistor 2SC1815(Y) | |
| Q8 | V01-0032-05 | Transistor 2SA562(Y) | |
| Q9 | V03-1815-06 | Transistor 2SC1815(Y) | |
| Q10 | V03-1959-06 | Transistor 2SC1959(Y) | |
| Q11 | V01-0113-05 | Transistor 2SA496(Y) | |
| Q12 ~ 15 | V03-1815-06 | Transistor 2SC1815(Y) | |
| Q16 | V01-0032-05 | Transistor 2SA562(Y) | |
| Q17 | V03-1815-06 | Transistor 2SC1815(Y) | |
| D1 | V11-0051-05 | Diode 1N60 | |
| D2 | V11-0076-05 | Diode 1S1555 | |
| D3 | V11-4171-06 | Zener diode XZ-142 | |
| D4 | V11-4172-06 | Zener diode XZ-162 | |
| D5 | V11-0240-05 | Zener diode WZ-090 | |
| D6 | V11-4162-16 | Zener diode XZ-132 | |
| D7 ~ 11 13 ~ 15 | V11-0076-05 | Diode 1S1555 | |
| D16 | V11-0243-05 | Zener diode WZ-061 | |
| D17 | V11-0076-05 | Diode 1S1555 | |
| D12 | NOT USED | | |
| | | **COIL** | |
| L1 | L39-0406-05 | Detector coil | |
| L2.3 5.6 | L40-1021-03 | Ferri-inductor 1 mH | |
| | | **MISCELLANEOUS** | |
| RL1 | S51-4402-05 | Relay | |
| | E04-0154-05 | Coaxial connector × 4 | ☆ |
| | E23-0047-04 | Terminal × 5 | |

# PACKING/DISASSEMBLY

## PACKING




## DISASSEMBLY

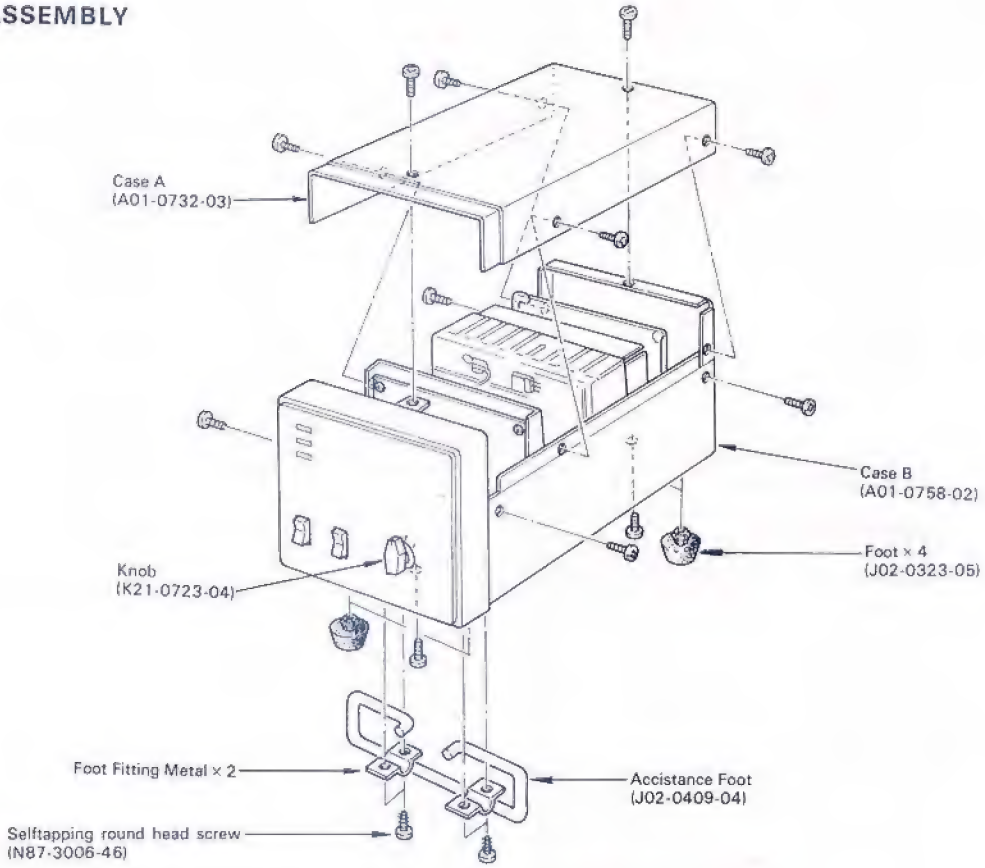



Fig. 7 Case disassembly

# DISASSEMBLY

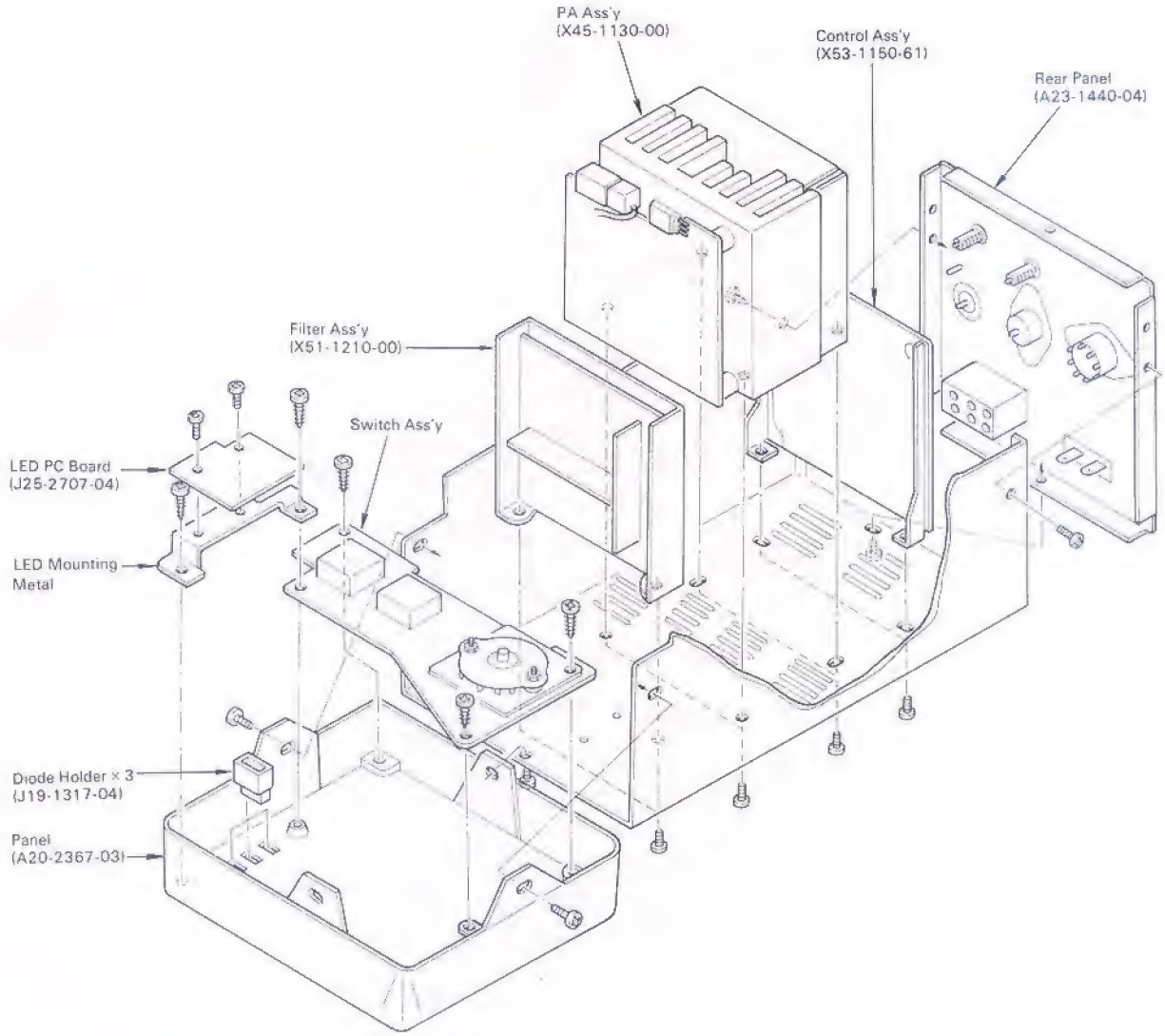



Fig. 8 Frontpanel disassembly/Mounting PC Board

# DISASSEMBLY

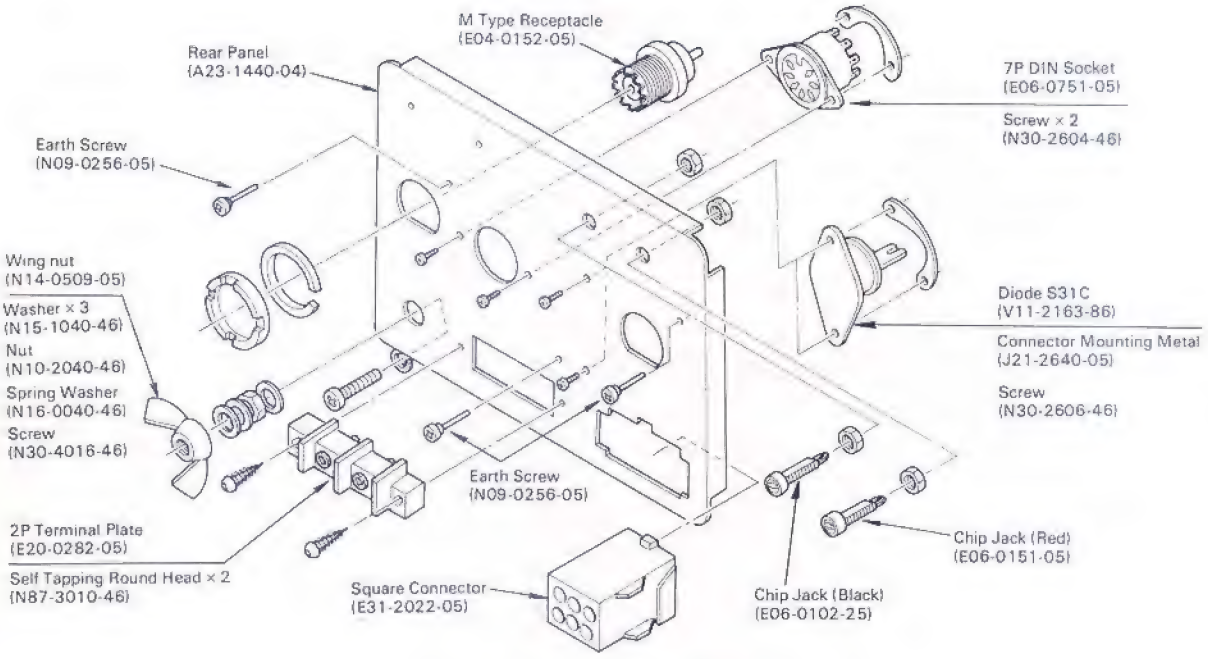



Fig. 9 Rear panel disaasembly

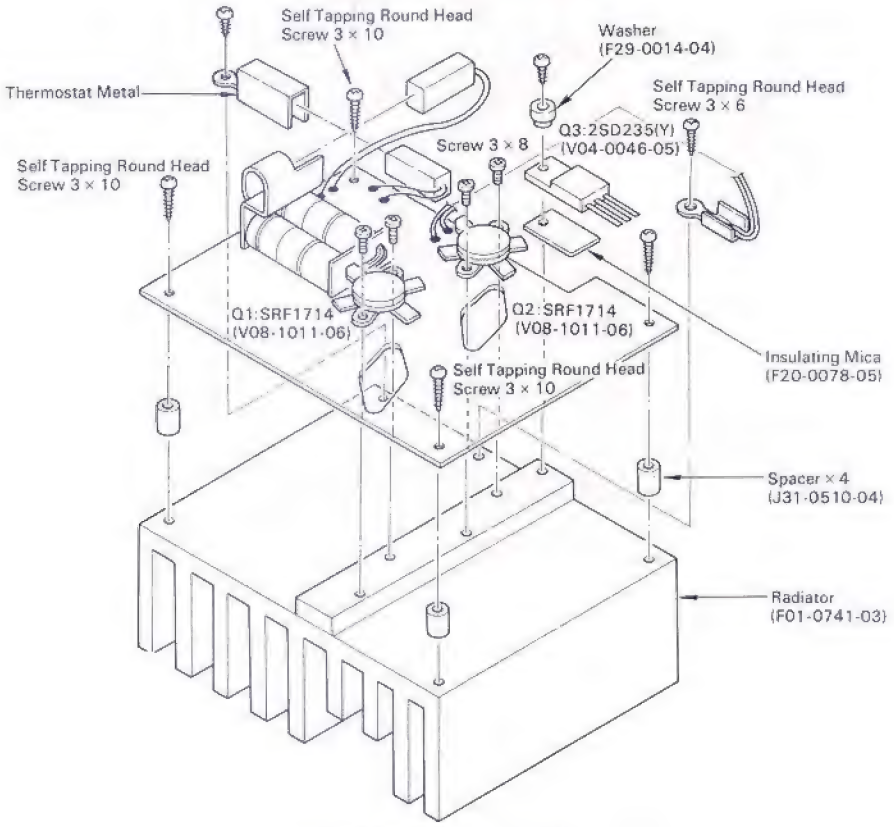
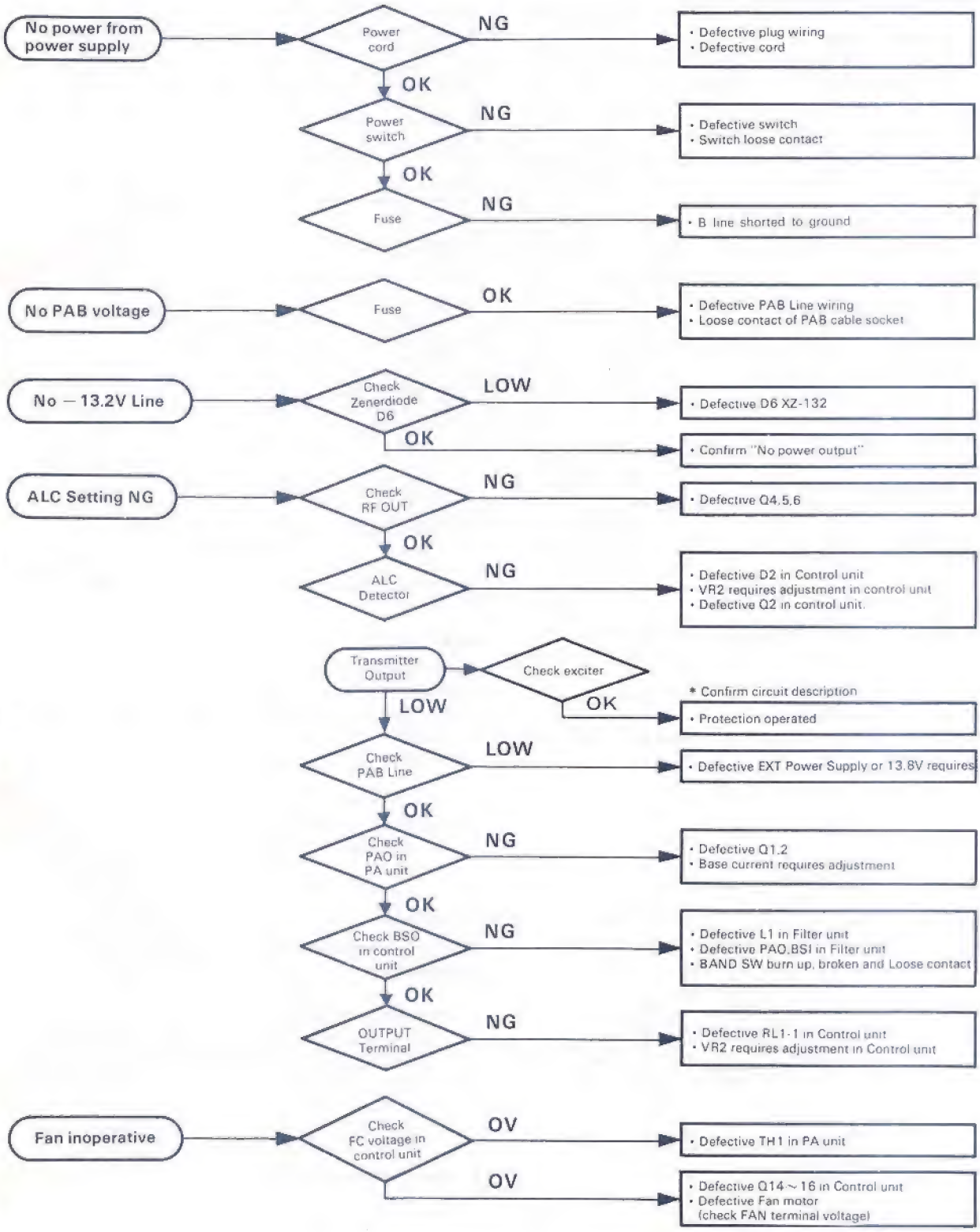



Fig. 10 PA unit disassembly

# TROUBLESHOOTING



# ADJUSTMENTS

## TEST EQUIPMENT REQUIRED

**1. STVM or DVM**

1) Input resistance: More than 1 MΩ
2) Voltage range: 1.5 to 20V DC

**Note:**

High-precision voltmeter maybe used.
However accurate readings can not be obtained for high-impedance circuits.

**2. DC CURRENT METER**

Current range: 200mA, 20A

**Note:** High-precision current meter maybe used.

**3. RF DUMMY LOAD**

1) Impedance: 50Ω, 150Ω
2) Dissipation: 100W continuous or greater

**4. BIRD WATT METER**

Dissipation: 100W continuous or greater

**5. DRIVE (EXCITER)**

Input: 16 to 20 watt ex. TS-120V

**6. POWER SUPPLY**

13.8V, 20A min. PS-30 or higher class.

## PREOPERATION

1. Remove the upper and lower cases as shown below Figure 11.
2. Power supply voltage is 13.8V 20A operation.
3. Disconnect PAB (red wire) in the PA unit and red wire of rear panel.
4. Disconnect the ANT coaxial cable between exciter (TS-120V) and Linear amp (TL-120).
5. If power transistor are changed in the PA unit (X45-1430-00).
   They must be of the same rank.

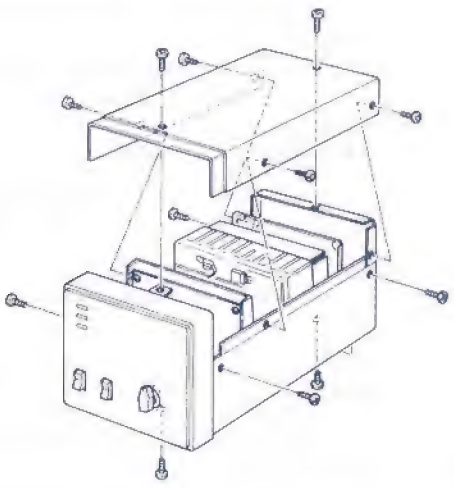


Fig. 11 Case disassembly

**SRF1714 (V08-1011-06)**

| Color | hfe | Color | hfe |
|---|---|---|---|
| Red | 20 ~ 32 | Blue | 57 ~ 78 |
| Orange | 28 ~ 42 | Violet | 72 ~ 93 |
| Yellow | 38 ~ 52 | Black | 87 ~ 108 |
| Green | 48 ~ 63 | Brown | 100 ~ 120 |

## CONNECTION

Connect the Linear amp TL-120 to exciter (TS-120V) as shown below Fig. 12.

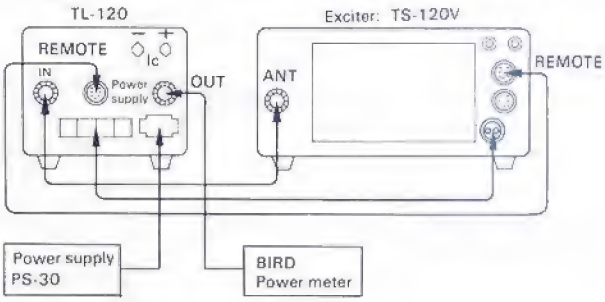



Fig. 12 Connection between TL-120 and exciter (TS-120V)

## SETTING

**1. EXCITER (TS-120V)**

BAND: 14.250 MHz, MODE: CW, STBY SW: REC
CAR VR: Counterclockwise, POWER SW: ON, etc: Free

**2. TL-120**

POWER SW: OFF, LINEAR SW: STBY, BAND SW: 14 MHz
BAND: 14 MHz
CONTROL UNIT VR1, VR2: Fullclockwise
FILTER UNIT VR1: Fullclockwise

## ADJUSTMENT

**1. 9V adjustment and check DC-DC converter**

- **Instrument**
  1) Voltmeter or Digital voltmeter
- **Adjusting procedure**
  1) Connect the digital voltmeter to TP3 on the CONTROL unit (X53-1150-61) and adjust VR3 on the CONTROL unit for 9.0V ±0.1V.
  2) Connect the digital voltmeter to TP2 on the CONTROL unit (X53-1150-61). Then, turn OPERATE LINEAR SW and check that DC volt is −13.2V ±0.5V.

**2. Base current adjustment**

- **Instrument**
  1) DC current meter (200 mA, 10A)
  2) Voltmeter

# ADJUSTMENTS

- **Adjusting procedure**

1) Connect the current meter between REDWIRE ⊖ and REARPANEL RED WIRE ⊕ in the PA unit (X45-1130-00). Place STBY SW to SEND on the exciter, and after 15 seconds, adjust VR1 on the PA unit for 200 mA.
2) Place STBY SW to REC on the exciter, connect the exciter, ANT terminal TL-120 IN terminal. Then, Connect the voltmeter to Ic terminal on the Linear amp.
3) Place STBY SW to SEND on the exciter, and reduce the CAR VR so the current meter reads 10A. Connect the voltmeter to Ic terminal on the rear panel, and adjust VR4 in the CONTROL unit (X53-1150-61) for voltmeter reading of 0.1V. Then, connect the RED WIRE (FINAL) to REDWIRE on the rear panel.
* Must be STBY SW to REC, if connect between REDWIRE and REDWIRE (rear panel).

**3. ALC adjustment**

- **Instruments**

1) Power meter

- **Adjusting procedure**

1) Exciter CAR VR is FULLCLOCKWISE, place STBY SW to SEND. Adjust VR2 on the CONTROL unit (X53-1150-61) until the RF POWER meter reads 95W.

**4. Protection adjustment**

- **Instrument**

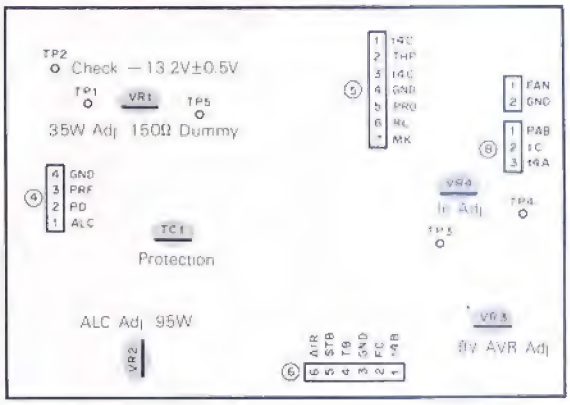
1) Power meter
2) Voltmeter
3) RF dummy load: 150Ω/100W

- **Adjusting procedure**

1) Exciter: 3.750 MHz, TL-120: 21 MHz Band. Turn STBY SW to SEND, maximum output is detained with TL-120. Connect the voltmeter to TP1 on the FILTER unit (X51-1210-00) and adjust TC1 on the FILTER unit for volt reading of dip point.
2) Exciter: 14.250 MHz, TL-120: 14 MHz Band, turn STBY SW to SEND. Connect the voltmeter to TP1 on the CONTROL unit (X53-1150-61) and adjust TC1 on the CONTROL unit for volt reading of dip point.
3) Exciter: 28.000 MHz, TL-120: 28 MHz Band, Turn STBY SW to SEND, and adjust the CAR LEVEL VR so the ALC meter reads Limit of ALC zone. Turn STBY SW to REC, with the BAND to 21 MHz, turn STBY SW to SEND again, adjust VR1 on the FILTER unit (X51-1210-00) so the PRO indicator lights.
4) Exciter: 14.250 MHz, TL-120: 14 MHz Band, connect the BIRD power meter and 150 ohm RF dummy load, then, turn STBY SW to SEND and adjust the CAR LEVEL VR so the ALC meter reads limit of ALC zone, adjust VR1 on the CONTROL unit (X53-1150-61) until the BIRD power meter reads 35W (FORWARD RF POWER).

## PC BOARD ALIGNMENT

### CONTROL UNIT (X53-1150-61)



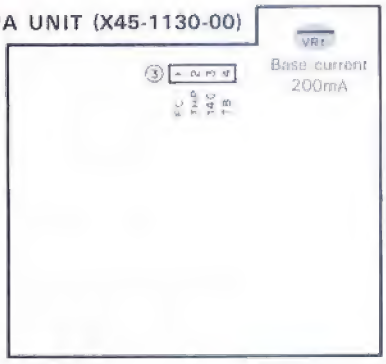

TOP VIEW

### FILTER UNIT (X51-1210-00)

TOP VIEW

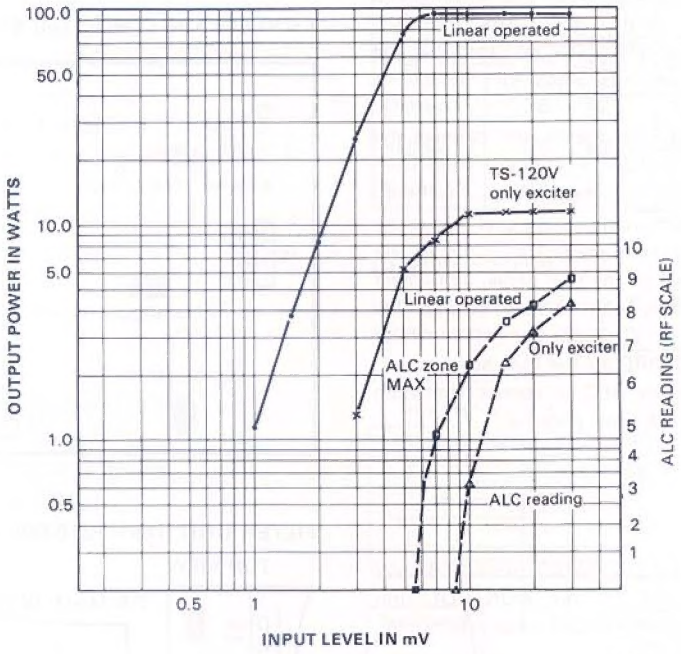

TOP VIEW

### PA UNIT (X45-1130-00)



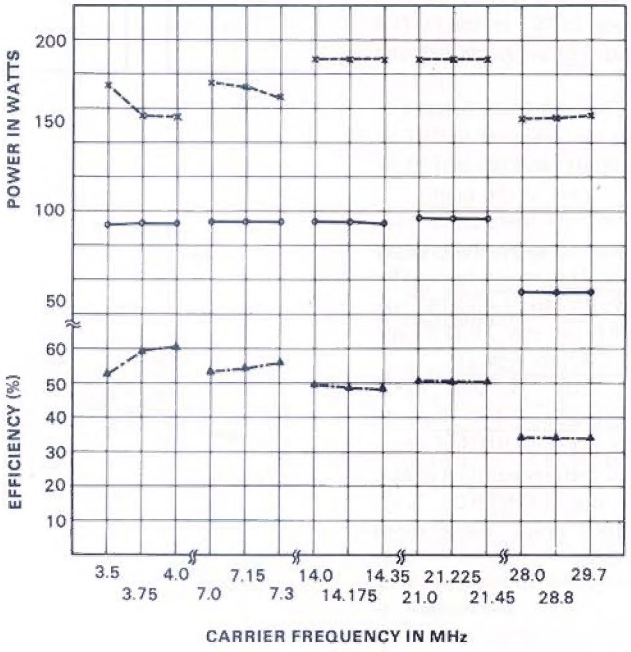
# REFERENCE DATA (EXAMPLE)

### OUTPUT VS INPUT




SIGNAL FREQ. : 14.170 MHz
MODE : CW
MIC GAIN : 9 O'CLOCK
EXCITER : TS-120V

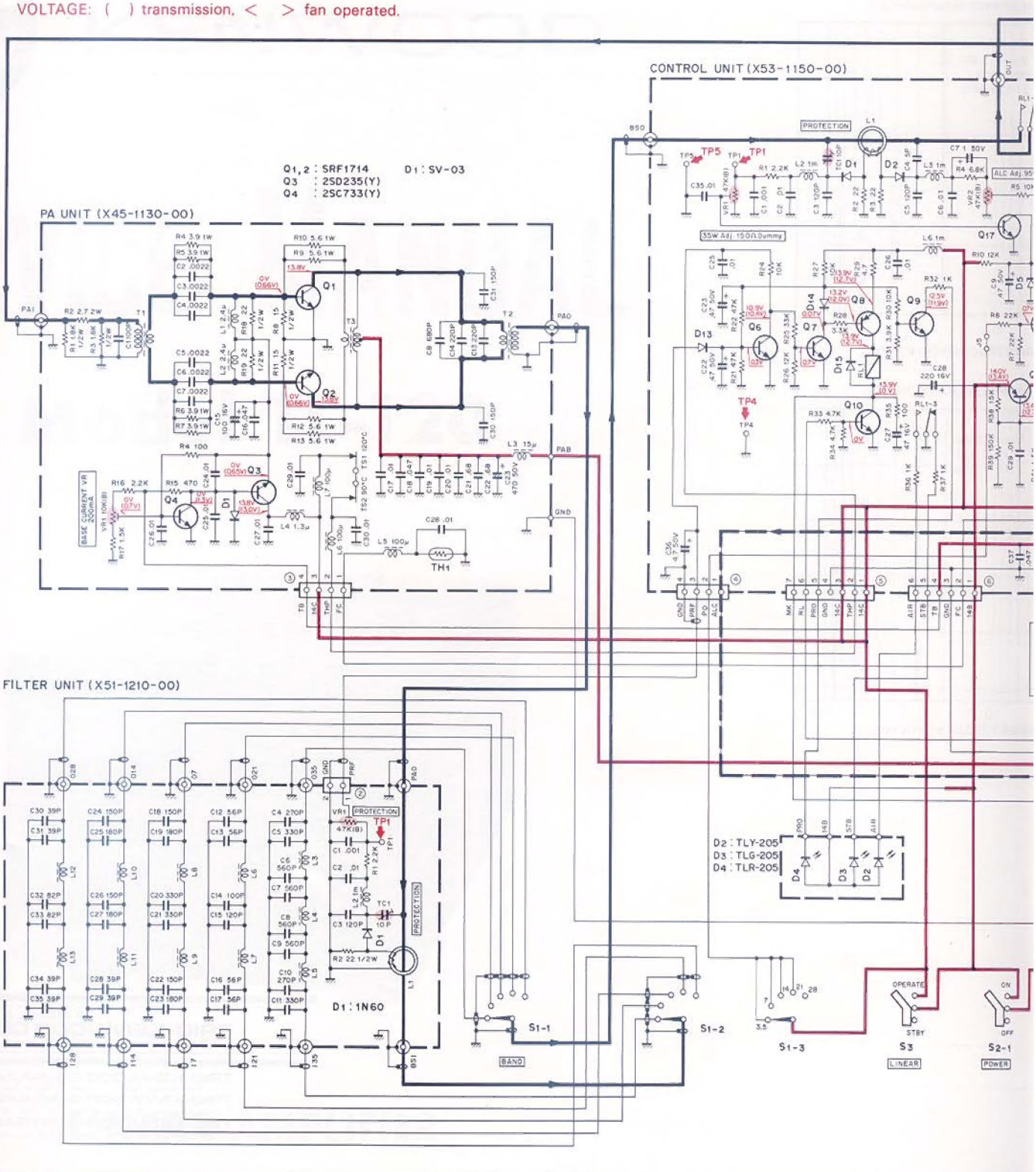
### OUTPUT CHARACTERISTIC



# SCHEMATIC DIAGRAM

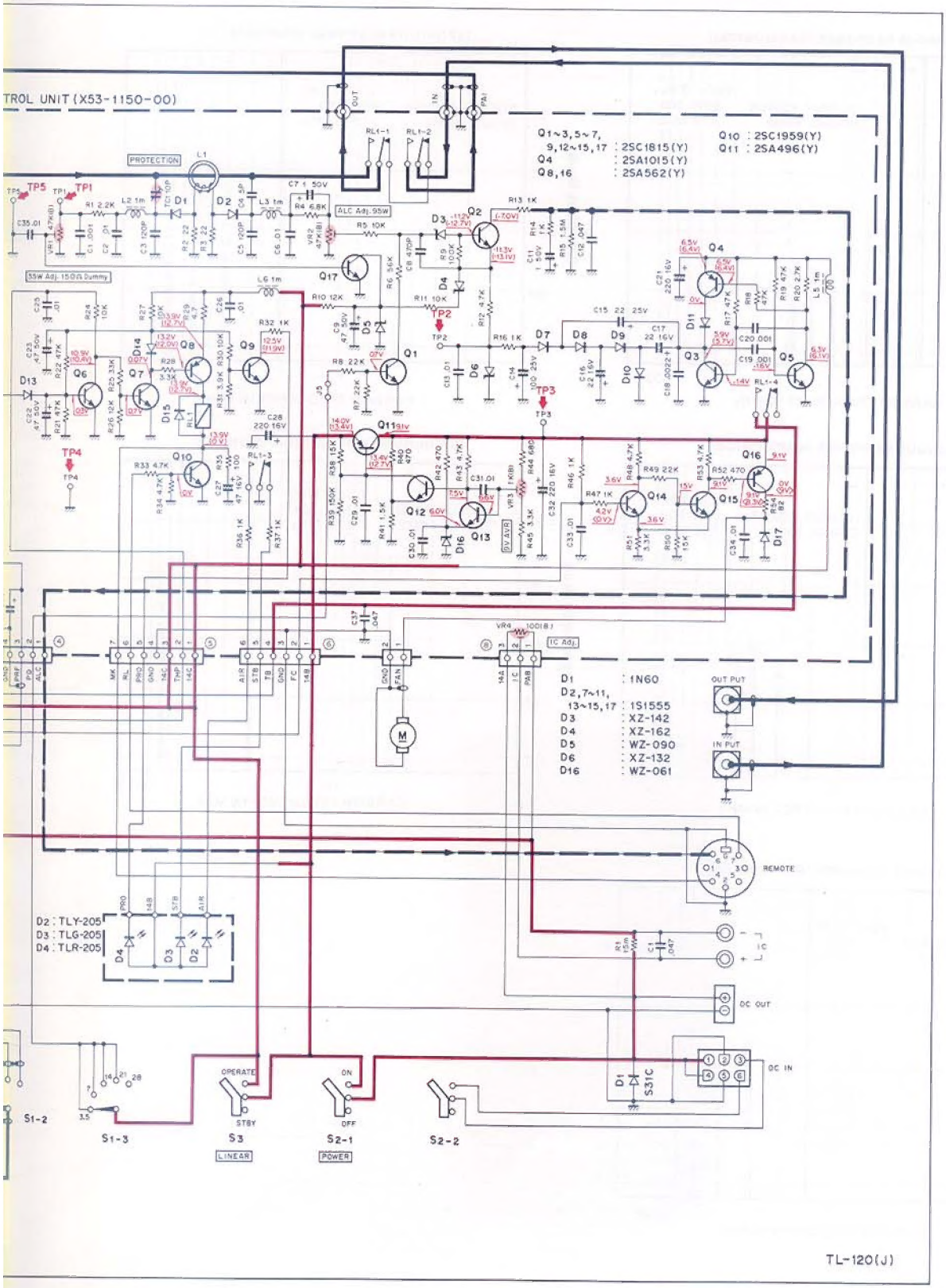
SIGNAL — CONTROL SIGNAL — COMMON VOLTAGE LINE

VOLTAGE: ( ) transmission, < > fan operated.



# MATIC DIAGRAM

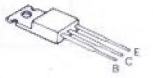
■ The curcuit and ratings change without notice due to developement in technology.




2SA1015(Y)
2SC1815(Y)
2SC1959(Y)

2SA562(Y)
2SC733(Y)

2SD235(Y)

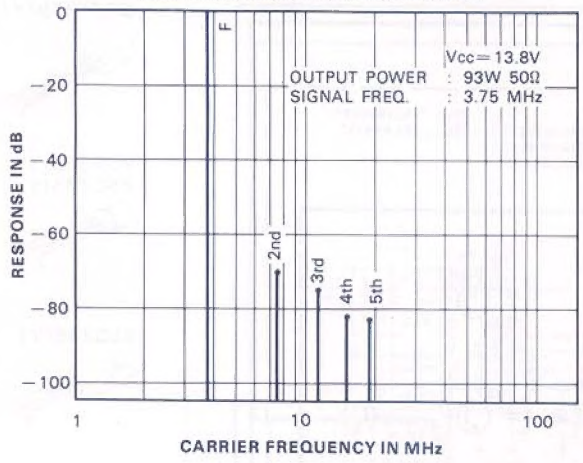


2SA496(Y)

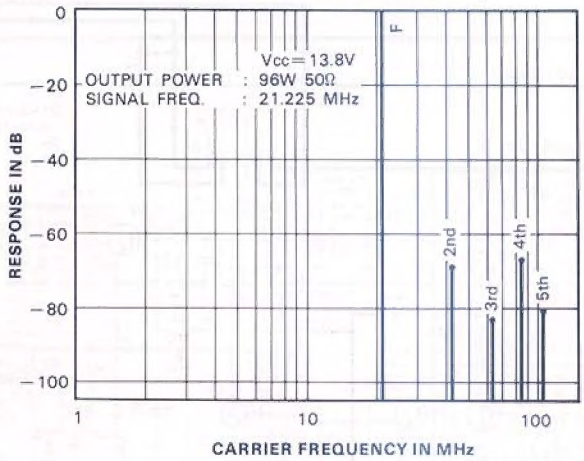
SRF1714

# REFERENCE DATA (EXAMPLE)

[SPURIOUS RESPONSE (HARMONICS)]




[SPURIOUS RESPONSE (HARMONICS)]

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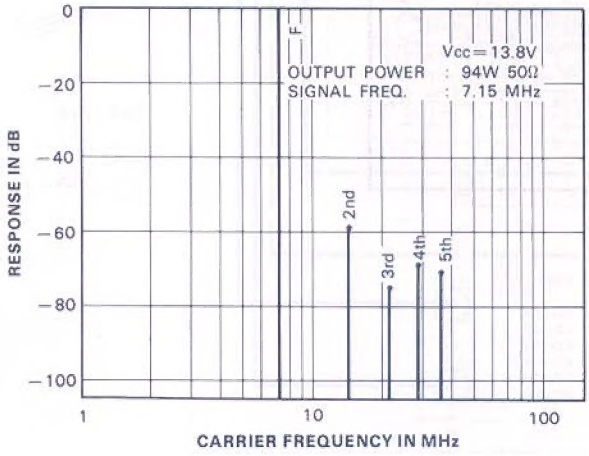


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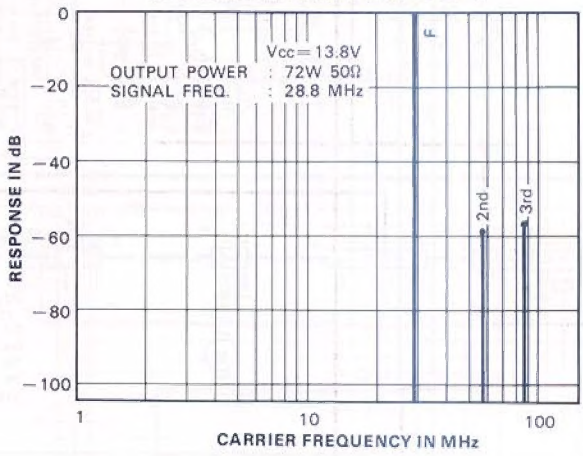


[SPURIOUS RESPONSE (HARMONICS)]